Name: ___

St Catherine's School
Waverley

2017 Assessment Task 2

Year 10   Mathematics 5.2/5.3

General Instructions

- Reading Time – 3 minutes
- Working Time – 55 minutes
- This is an open book task (You can have an A4 page of notes with you).
- Write using black or blue pen. Black pen is preferred
- Board-approved calculators may be used
- All questions are to be attempted
- In Section II, show all relevant mathematical reasoning and/or calculations
- · Marks may be deducted for careless or badly arranged work
- Answer all questions in the space provided.
- **Task Weighting – 20%**

Section I – Multiple Choice	/5
Section II Question 6	/10
Section II Question 7	/15
Section II Question 8	/13
Section II Question 9	/11
Total	/54

Section I

Multiple Choice (5 marks)

Circle your selection from the four choices given.

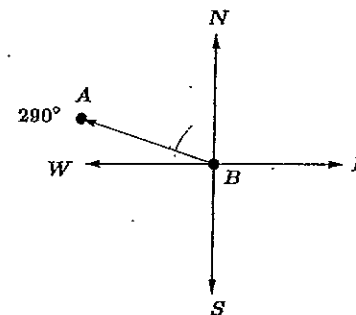1) Which of the following lines is perpendicular to $y = \frac{2x}{5} - 4$?

(A) $y = \frac{2x}{5} + 3$

(B) $5x + 2y - 14 = 0$

(C) $2x - 5y = 12$

(D) $y = \frac{5x}{2} + 3$

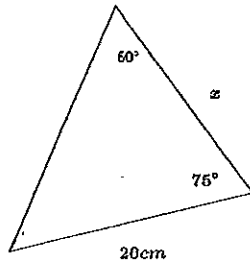2) If the bearing of A from B is 290°, then the bearing of B from A is

(A) 110°

(B) 090°

(C) 100°

(D) 200°

3)

The correct equation to find the value of x in the triangle above is

(A) $\quad \dfrac{x}{\sin 75^\circ} = \dfrac{20}{\sin 50^\circ}$

(B) $\quad \cos 75^\circ = \dfrac{20}{x}$

(C) $\quad \dfrac{x}{\sin 75^\circ} = \dfrac{20}{\sin 55^\circ}$

(D) $\quad \dfrac{x}{\sin 55^\circ} = \dfrac{20}{\sin 50^\circ}$

4) $0.05\ GB =$

(A) $5\ 000\ 000\ B$

(B) $50\ MB$

(C) $500\ KB$

(D) $500\ MB$

5) The length of a desk is given as $65\ cm$. The error in this measurement is

(A) $\pm 1\ cm$

(B) $\pm 0.5\ cm$

(C) $\pm 0.05\ cm$

(D) $\pm 0.2\ cm$

Show all working for this section.

Marks

Question 6 (10 marks)

a) Solve simultaneously the equations

$$3x - 2y = 45$$
$$x + 5y = -2$$

3

b) A theatre charges adults $25 entry, and it charges children $12. On one particular night when there were 47 people in the audience, the total ticket sales was $980.

i) Form two equations to represent the information given.

1

ii) Solve these equations simultaneously to find the number of children that attended.

2

Question 6 continues on the next page

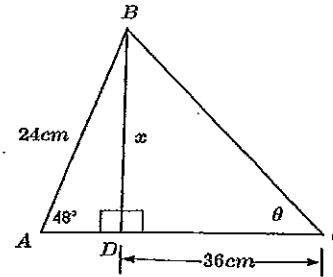c)   i)   Find the gradient of the line $2x + 6y - 3 = 0$.   1

        ii)   Find the equation of the line perpendicular to $2x + 6y - 3 = 0$ that passes through   3
                the point $(4,10)$.

a)

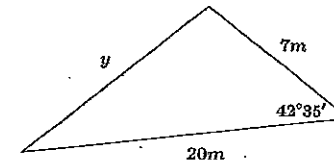   i)   By referring to $\triangle BDA$, find the value of x correct to 1 decimal place.   2

        ii)   Hence find the value of the angle θ, correct to the nearest degree.   2

b)   Use the Cosine Rule to find the value of the pronumeral. (1 decimal place).   2

Question 7 continues on the next page

c) In triangle PQR, $PQ = 35\ cm$, $QR = 18\ cm$ and $\angle PRQ = 102°$.
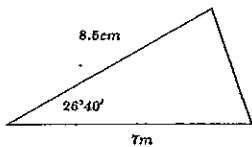
    i) Draw triangle PQR showing the information given.

    ii) Use the Sine Rule to find the size of $\angle QPR$ (nearest minute).   **2**
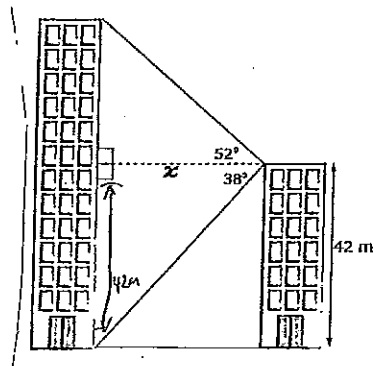
d) Find the area of the triangle shown.   **2**

8.5cm

26°40'

7m

e) From the top of a 42 metre building, the angle of elevation to the top of the building next to it is 52°, and the angle of depression to the base of the same building is 38° (as shown).

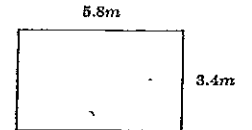Find the height of the taller building to the nearest metre. (you may need to find another length first).   **4**

52°
38°
x
42 m

8

Question 8 (13 marks)

5.8m

3.4m

a) The dimensions of a rectangle are given as $5.8\ m$ by $3.4\ m$.

    i) What is the error in measurement of each side length?   **1**

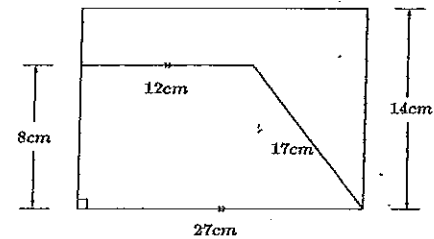   ii) State the lower and upper dimensions of this rectangle given the error in part i).   **1**

    iii) Hence calculate the lower and upper limits on the area of this rectangle.   **1**

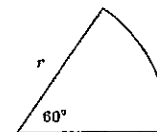b) Find the shaded area of the figure below: **2**

12cm
14cm
8cm
17cm
27cm

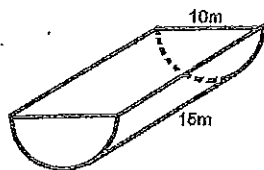c) The area of the sector shown is $120\ cm^2$.   **3**

Find its radius correct to 1 decimal place.

r

60°

Question 8 continues on the next page

d) Find the surface area of the half cylinder shown correct to 1 decimal place. **2**

10m

15m

e) A rectangular metal block has two cylindrical holes bored through it, as shown in the diagram. The diameter of these cylindrical holes is 4 cm.

Find the surface area of this metal block, including the inside of the cylindrical holes (1d.p.)

3

4cm

SA_r

10cm

SA_h

16cm

12cm

Question 9 (11 marks)

a) Two planes leave Sydney airport. Plane A travels 400 km on a bearing of 330°, while plane B travels 1200 km on a bearing of 250°.
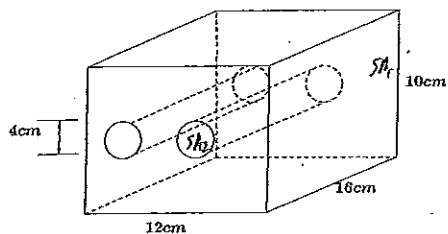
i) Draw a neat diagram showing this information. **1**

ii) Calculate the distance between the two planes when they land correct to the nearest kilometre. **2**
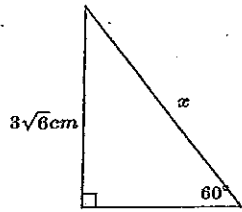
iii) Calculate the bearing of plane A from plane B correct to the nearest degree. **3**

Question 9 continues on the next page

10

b)   Find the exact value of the side marked x (you must show working).   2

c)   A fisherman out at sea observes a cliff at an angle of elevation of 15°. He then moves 100m toward the cliff. He then observes the angle of elevation is 25°. Find the height, h, of the cliff to the nearest metre. Hint: First find the length x.   3
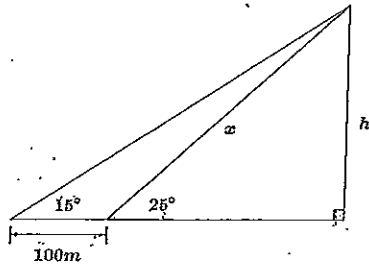
END OF TEST

Page 12

Section II

Show all working for this section.   Marks

Question 6 (10 marks)

a)   Solve simultaneously the equations

$$3x - 2y = 45$$
$$\times 3 \, [x + 5y = -2]$$ 3

$3x - 2y = 45$
$- 3x + 15y = -6$

$x + 5y = -2$
$x + (-15) = -2$
$x = -2 + 15$
$x = 13$

$-2y - 15y = 51$
$-17y = 51$
$y = \frac{51}{-17}$
$y = -3$

$\therefore y = -3$ and $x = 13$

$\Big\}$ 3

b)   A theatre charges adults $25 entry, and it charges children $12. On one particular night when there were 47 people in the audience, the total ticket sales was $980.

i)   Form two equations to represent the information given.   1

Let $x =$ adults
Let $y =$ children

$25x + 12y = \$980$
$x + y = 47$

ii)   Solve these equations simultaneously to find the number of children that attended.   2

$25x + 12y$

$\times 25 \, [x + y = 47]$

$25x + 12y = 980$
$25x + 25y = 1175$

$12y - 25y = -195$
$-13y = -195$
$y = \frac{-195}{-13}$
$y = 15$

$x + 13 = 47$
$x = 34$

$\therefore x = 34$ and $y = 13$

Question 6 continues on the next page

Page 5

c) i) Find the gradient of the line $2x + 6y - 3 = 0$. **1**

$6y = -2x + 3$

$y = \frac{-1}{3}x + \frac{1}{2}$ $m = \frac{-1}{3}$ |

ii) Find the equation of the line perpendicular to $2x + 6y - 3 = 0$ that passes through the point $(4,10)$. **3**

$y = \frac{1}{3}x + \frac{1}{2}$

$m_1 = \frac{1}{3}$ $m_2 = -3$ / $(4, 10)$.

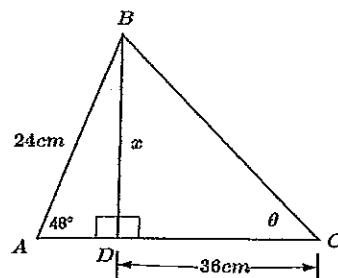$y - y_1 = m(x - x_1)$

$y - 10 = -3(x - 4)$ /

$y - 10 = -3x + 12$

$y = -3x + 12 + 10$ /

$y = -3x + 22$.

3

Question 7 (15 marks)

a)

i) By referring to $\triangle BDA$, find the value of x correct to 1 decimal place. **2**

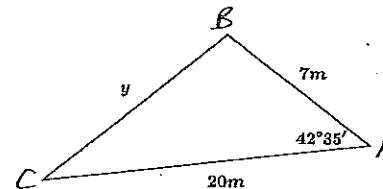$\sin\theta = \frac{opp}{hyp}$ $x = 24\sin 48$

$\sin 48° = \frac{x}{24}$ $x = 17.8 cm$ / /

ii) Hence find the value of the angle θ, correct to the nearest degree. **2**

$\tan\theta = \frac{opp}{adj}$ $\theta = 26°$ / /

$\tan\theta = \frac{17.8}{36}$

$\theta = \tan^{-1}\left(\frac{17.8}{36}\right)$

b) Use the Cosine Rule to find the value of the pronumeral. (1 decimal place). **2**

$a^2 = b^2 + c^2 - 2bc\cos A$

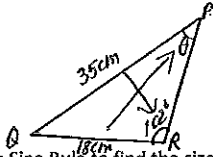$y^2 = 20^2 + 7^2 - 2 \times 20 \times 7 \times \cos 42°35'$

$y^2 = 242.8$ / /

$y = \sqrt{242.8}$

$y = 15.6 m$

Question 7 continues on the next page

$= 6$

c) In triangle PQR, $PQ = 35\ cm$, $QR = 18\ cm$ and $\angle PRQ = 102°$.

   i) Draw triangle PQR showing the information given.

   (1)

   ii) Use the Sine Rule to find the size of $\angle QPR$ (nearest minute).

   (2)

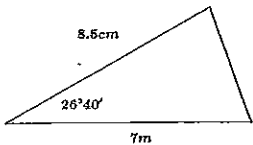 $$\frac{\sin\theta}{18} = \frac{\sin 102°}{35}$$

   $$\sin\theta = \frac{\sin 102°}{35} \times 18$$

   $$\theta = \sin^{-1}\left(\frac{18\sin 102°}{35}\right)$$

   $\theta = 30°12'$

   (2)

d) Find the area of the triangle shown.
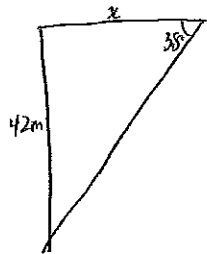
   8.5cm
   26°40'
   7m

   $A = \frac{1}{2}ab\sin C$

   $A = \frac{1}{2} \times 8.5 \times 7 \times \sin 26°40'$

   $A = 13.35 m^2$

e) From the top of a 42 metre building, the angle of elevation to the top of the building next to it is 52°, and the angle of depression to the base of the same building is 38° (as shown).

   4

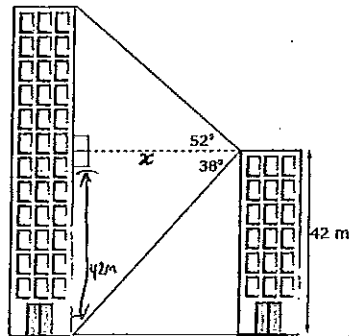   Find the height of the taller building to the nearest metre. (you may need to find another length first).

   x
   38°
   42m

   $\tan\theta = \frac{opp}{adj}$

   $\tan 38° = \frac{42}{x}$

   $x = \frac{42}{\tan 38°}$

   $x = 54 m$

   52°
   x
   38°
   42 m

   42m

   h
   52°

   $\tan\theta = \frac{opp}{adj}$

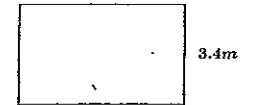 $\tan 52° = \frac{h}{54}$

   $h = 54\tan 52°$

   ∴ the height of the taller building is
   $69 + 42 = 111m$.

   9

Page 8

Question 8 (13 marks)

5.8m
3.4m

a) The dimensions of a rectangle are given as 5.8 m by 3.4 m.

   i) What is the error in measurement of each side length?

   1

   $GPE = \pm\frac{1}{2} \times 0.1 = \pm 0.05$

   ii) State the lower and upper dimensions of this rectangle given the error in part i).
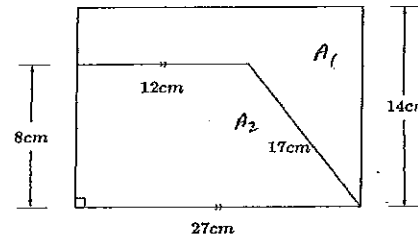
   1

   $5.8 + 0.05$ $3.4 + 0.05$ $3.4 - 0.05$

   $= 5.85$ $5.8 - 0.05 = 5.75$ $= 3.45$ $= 3.35$

   iii) Hence calculate the lower and upper limits on the area of this rectangle.

   1

   $A_L = 5.75 \times 3.35$ $A_u = 5.85 \times 3.45$

   $= 19.3\ m^2$ $= 20.2\ m^2$

b) Find the shaded area of the figure below:

   2

   12cm
   8cm
   A_1
   A_2
   17cm
   14cm
   27cm

   $A_1 = b \times h$

   $A_1 = 14 \times 27$

   $A_1 = 378 cm^2$

   $A_2 = \frac{h(a+b)}{2}$

   $A_2 = \frac{8(12+27)}{2}$

   $A_2 = 156 cm^2$

   $TA = 378 - 156$

   $= 222 cm^2$

   (2)

c) The area of the sector shown is $120\ cm^2$.

   3

   Find its radius correct to 1 decimal place.

   r
   60°
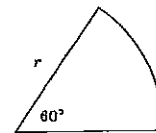
   $A = \pi r^2 \times \frac{60}{360}$

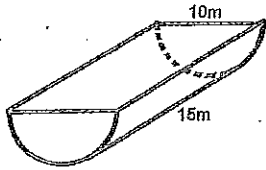 $\frac{360}{60} \times 120 = \pi \times r^2$

   $r^2 = \frac{720}{\pi}$

   $r^2 = 229.18$ $r = 15.1\ cm$

   Question 8 continues on the next page

Page 9

d) Find the surface area of the half cylinder shown correct to 1 decimal place. **2**

$$SA = A_{rectangle} + A_{curved\ edge} + 2A_{semi-circle}$$

$$= 10 \times 15 + \frac{2\pi r h}{2} + 2 \times \frac{1}{2} \times \pi r^2$$

$$= 10 \times 15 + \pi \times 5 \times 15 + \pi \times 5^2$$

$$= 464.2 \ m^2$$

e) A rectangular metal block has two cylindrical holes bored through it, as shown in the diagram. The diameter of these cylindrical holes is 4 cm.

Find the surface area of this metal block, including the inside of the cylindrical holes (1d.p.) **3**

$$SA_1 = 2(10 \times 16 + 10 \times 12 + 12 \times 16)$$
$$- 4(\pi \times 2^2)$$
$$= 944 \ cm^2$$

$$SA_2 = 2(2\pi r h)$$
$$= 2 \times 2 \times \pi \times 2 \times 16$$
$$= 402.1 \ cm^2$$
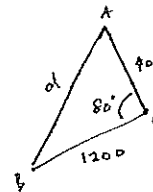
$$SA = SA_1 + SA_2$$
$$= 1346.1 \ cm^2$$

Question 9 (11 marks)

a) Two planes leave Sydney airport. Plane A travels 400 km on a bearing of 330°, while plane B travels 1200 km on a bearing of 250°.
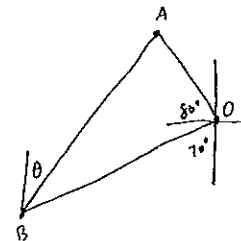
i) Draw a neat diagram showing this information. **1**

✓ 1
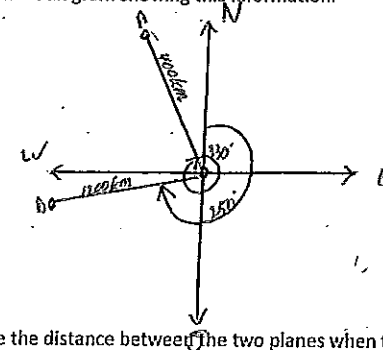
ii) Calculate the distance between the two planes when they land correct to the nearest kilometre. **2**

$$d^2 = 400^2 + 1200^2 - 2 \times 1200 \times 400 \cos 80°$$
$$= 1433297.7$$
$$d = 1197 \ km.$$

iii) Calculate the bearing of plane A from plane B correct to the nearest degree. **3**
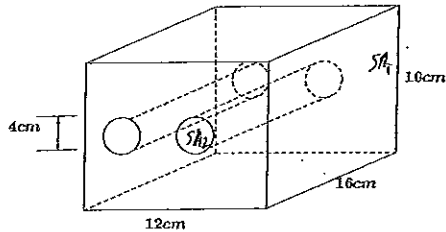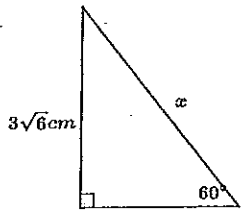

$$\cos(\angle ABO) = \frac{1200^2 + 1197^2 - 400^2}{2 \times 1200 \times 1197}$$
$$= 0.944$$
$$\angle ABO = \cos^{-1} 0.944$$
$$= 19°$$
$$\theta = 70 - 19 \quad \text{(alternate angles, adj} \angle\text{'s)}$$
$$= 51°$$

A is on a bearing of 51° from B.

Question 9 continues on the next page

b)   Find the exact value of the side marked x (you must show working).   2

$3\sqrt{6}cm$

x

$60°$

$$\sin\theta = \frac{opp}{hyp}$$

$$\sin60° = \frac{3\sqrt{6}}{x} \quad \checkmark$$

$$x = \frac{3\sqrt{6}}{\sin60°} \quad \checkmark\,2$$

$$x = \frac{\sqrt{54}}{\sin60°}$$

c)   A fisherman out at sea observes a cliff at an angle of elevation of 15°. He then moves   3
100m toward the cliff. He then observes the angle of elevation is 25°. Find the
height, h, of the cliff to the nearest metre. **Hint:** First find the length x.

$15° + \alpha = 25°$

$\alpha = 10°$

$$\frac{x}{\sin15°} = \frac{100}{\sin10°}$$

$$x = \frac{100\sin15°}{\sin10°}$$

$= 149\,m$

$h = x\sin25°$

$= 149\sin25°$

$= 63\,m$

x

h

$15°$ $25°$

$100m$

END OF TEST